PatientPlus articles are written for doctors and so the language can be technical. However, some people find that they add depth to the articles found in the other sections of this website which are written for non-medical people.

Carcinoembryonic Antigen (CEA)

Carcinoembryonic Antigen (CEA) is a glycoprotein which is produced in significant amounts by the large intestine during fetal development. It was first identified by Freedman and Gold in 1965 and acquired its name because it was found in the fetal colon and in colon adenocarcinoma, but not in healthy bowel. It has since been discovered that small amounts are present in the healthy colon intestine and in the blood. It may also be produced in significant amounts by other types of tumours (see below). Because raised levels may signify the presence of a tumour, it is known as a *cancer marker*.[1]

Conditions which may have elevated CEA[1]

- Colorectal cancer
- Colorectal liver metastases
- Breast cancer[2]
- Lung cancer[3]
- Skeletal metastases
- Nonmalignant liver disease[4]
- Pancreatic disease[5]
- Smoking
- Ageing[6]
- Atherosclerosis[6]

Normal range

Studies of patients with colorectal tumours suggest that the CEA level deemed to be normal is 2.5 mcg/L or less.[1] This level can double in smokers.

Uses of the CEA Test

Colorectal cancer

Diagnosis - The CEA test has a specificity of between 30-80%[7] and it is not recommended by NICE for the diagnosis of early colorectal cancer. NICE guidance advises that such a diagnosis should be based on a history of red flag symptoms and the finding of an abdominal or rectal mass. The only laboratory result of note is a finding of iron deficiency anaemia. In fact, NICE do not recommend delaying referral for the results of any tests, if there is sufficient clinical concern about the diagnosis.[8]

Staging - CEA in combination with other tumour markers (e.g. mucin tumour markers CA19-9, CA242) it can be used in pre-operative staging and thereby assist in the planning of the type of surgery required and future management options.[9]

Prognosis - The CEA test is of much more useful in determining prognosis than it is as an early diagnostic test for colon cancer. CEA levels tend to be higher in advanced disease. One study found that using a cut off point of 5 µg/L the proportions of patients with increased values were 3%, 25%, 45%, and 65% for patients with Dukes' A, B, C, and D disease respectively.[1] Well-differentiated carcinomas tend to produce more CEA than poorly-differentiated ones. Tumours on the right side of the colon tend to produce more CEA than tumours on the left side.

By comparing the levels before and after surgery, the test can be used to detect recurrence of tumour and monitor for the development of liver metastases. The CEA level can also be used to assess the response to chemotherapy. There is little evidence that monitoring CEA levels in all patients with colorectal cancer contributes to improved survival or enhanced quality of life and further work needs to be done on the quantitative significance of abnormal tests in specific clinical situations. However, it is likely that post-treatment CEA levels will eventually become a useful prognostic tool in selected cases in secondary care.[5] One study suggests that post-treatment levels are helpful in identifying recurrence, but normal levels do not necessarily indicate that recurrence has not occurred.[10]

Breast cancer

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